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Amendment to the Claims

This listing of claims replaces any prior versions or listings of claims in the application.

Listing of Claims

1 (currently amended). An apparatus comprising:

(a) a substrate mount for receiving a substrate,
(b) a dispensing device for dispensing reagents for synthesizing a biopolymer on a surface of said substrate, and
(c) ~~an~~ first optical system for positioning said substrate mount along said y-axis and ~~an~~ second optical system for positioning said dispensing device along said x-axis, said first and second optical systems cooperating to position said substrate mount and said dispensing device relative to one another,

wherein one of said substrate mount and said dispensing device is adapted for translation along a y-axis and for rotation about a central axis of the substrate mount that is parallel to a z-axis, and the other of said substrate mount and said dispensing device is adapted to move along an x-axis transversely to the direction of movement of said one.

2 (previously presented). An apparatus according to Claim 1 further comprising a touch system for positioning said substrate and said dispensing device along a z-axis wherein said touch system comprises at least two opposing touch probes wherein one of said touch probes is affixed to a support member of said apparatus to which the substrate mount is affixed and the other of said touch probes is affixed to a frame member of said apparatus to which said dispensing device is affixed.

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3 (currently amended). An apparatus according to Claim 1 wherein said first optical system for positioning said substrate mount comprises at least one image sensor and said substrate comprises at least one target image for imaging by said image sensor.

4 (currently amended). An apparatus according to Claim 1 wherein said apparatus further comprises a calibration system, said first and second optical systems and said calibration system cooperating to position said substrate mount along said y-axis and said dispensing device along said x-axis.

5 (currently amended). An apparatus according to Claim 4 wherein the calibration system comprises a locator device having a predetermined fixed target location and a camera acting in cooperation with said optical systems.

6 (currently amended). An apparatus according to Claim 2 wherein said substrate mount is adapted such that its orientation is adjusted to align said substrate along said y-axis as a result of input from said first optical system for positioning said substrate mount and wherein said dispensing device is adapted such that its orientation is adjusted to align said dispensing device along said x-axis as a result of input from said second optical system for positioning said dispensing device.

7 (currently amended). An apparatus according to Claim 6 wherein said first and second optical systems communicate with a computer, which provides input from said optical systems to said substrate mount and to said dispensing device and said touch system communicates with said computer.

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8 (currently amended). An apparatus according to Claim 1 further comprising a delivery device for delivering said substrate to said substrate mount, said delivery device having associated therewith a delivery device optical system for positioning said substrate to be within the field of view of the said support mount first optical system.

9 (currently amended). An apparatus according to Claim 8 wherein said ~~delivery device~~ second optical system comprises at least one image sensor and said substrate comprises at least one target image for imaging by said image sensor.

10 (withdrawn). An apparatus according to claim 1 for synthesizing a plurality of biopolymer features on the surface of a substrate, wherein said substrate mount is adapted for translation along an y-axis and for rotation about a central axis of the substrate mount that is parallel to a z-axis, and wherein said dispensing device moves transversely with respect to said substrate mount, and wherein said apparatus further comprises:

(d) a touch system for positioning said substrate and said dispensing device along a z-axis wherein said touch system comprises at least two opposing touch probes,

(e) a loading station for loading said reagents into said dispensing device,

(f) a mechanism for moving said dispensing device and/or said loading station relative to one another,

(g) a wash station for washing said dispensing device, and

(h) a mechanism for moving said dispensing device and/or said wash station relative to one another.

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11 (withdrawn). An apparatus according to Claim 10 further comprising an inspection device for inspecting the reagents dispensed to the surface of said substrate.

12 (withdrawn). An apparatus according to Claim 10 wherein said wash station comprises:

(a) a plurality of receptacles for sealingly engaging each head comprising said nozzles, said receptacles containing a wash solution,

(b) a wet wash pad for engaging a surface comprising said nozzles,

(c) a dry pad for engaging said surface, and

(d) a mechanism for moving said nozzles from said plurality of receptacles to said wet wash pad and then to said dry pad.

13 (withdrawn). An apparatus according to Claim 10 wherein said optical system for positioning said substrate mount comprises two or more image sensors and said substrate comprises a corresponding number of target images and said substrate comprises target images for imaging by said image sensors.

14 (withdrawn). An apparatus according to Claim 10 wherein said touch system comprises at least two opposing touch probes.

15 (withdrawn). An apparatus according to Claim 10 wherein said apparatus further comprises a calibration system, said optical systems and calibration system cooperating to position said substrate mount along said y-axis and said dispensing device along said x-axis.

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16 (withdrawn). An apparatus according to Claim 15 wherein said calibration system comprises a locator device having a predetermined fixed target location and a camera acting in cooperation with said optical systems.

17 (withdrawn). An apparatus according to Claim 10 wherein said substrate mount is adapted such that its orientation is adjusted to align said substrate along said y-axis as a result of input from said optical system for positioning said substrate mount and wherein said dispensing device is adapted such that its orientation is adjusted to align said dispensing device along said x-axis as a result of input from said optical system for positioning said dispensing device.

18 (withdrawn). An apparatus according to Claim 10 further comprising a delivery device for delivering said substrate to said substrate mount, said delivery device having associated therewith a delivery device optical system for positioning said substrate to be within the field of view of the said support mount optical system.

19 (withdrawn). An apparatus according to Claim 18 wherein said delivery device optical system comprises two or more image sensors and said substrate comprises a corresponding number of target images.

20 (withdrawn). A method employing an apparatus according to claim 1, said method comprising:

- (a) positioning a substrate along a y-axis by means of an optical system,
- (b) positioning a dispensing device along an x-axis by means of an optical system, said optical systems

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cooperating to position said substrate mount and said dispensing device relative to one another,

(c) positioning said substrate and said dispensing device relative to one another along an orthogonal axis by means of at least one touch system, and

(d) depositing a reagent for synthesizing a biopolymer on a surface of said substrate by means of said dispensing device.

21 (withdrawn). A method according to Claim 20 wherein said optical system for positioning said substrate mount comprises two or more image sensors and said substrate comprises a corresponding number of target images.

22 (withdrawn). A method according to Claim 20 wherein said positioning of step (a) involves a calibration system, said optical systems and said calibration system cooperating to position said substrate mount along said y-axis and said dispensing device along said x-axis.

23 (withdrawn). A method according to Claim 22 wherein said calibration system comprises a locator device having a predetermined fixed target location and a camera acting in cooperation with said optical system.

24 (withdrawn). A method according to Claim 23 wherein adjustments are made to the orientation of said substrate along said x-axis as a result of input from said optical system and wherein adjustments are made to the orientation of said dispensing device and said substrate mount along said y-axis as a result of input from said optical system.

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25 (withdrawn). A method according to Claim 20 wherein said system comprises touch probes that are aligned optically.

26 (currently amended). A method for synthesizing an array of biopolymers on a surface of a substrate, said method comprising, in multiple rounds of subunit additions, adding one or more polymer subunits at each of multiple feature locations on said surface to form one or more arrays on said surface, each round of subunit additions comprising:

(a) bringing said substrate and a dispensing system for dispensing said polymer subunits for the synthesis of said biopolymers into a dispensing position relative to said activated discrete sites on said surface; ~~wherein~~

(b) positioning said substrate ~~is positioned~~ along a y-axis ~~by means of using an~~ first optical system; and

(c) positioning said dispensing system ~~is positioned~~ along an x-axis and ~~said substrate mount and said dispensing system are positioned relative to one another by means of said optical systems using a second optical system;~~ and ~~wherein~~

(d) positioning said dispensing system ~~is positioned~~ along a z-axis ~~by means of using~~ at least one touch system wherein said touch system comprises at least two opposing touch probes wherein one of said touch probes is affixed to a support member of said apparatus to which the substrate mount is affixed and the other of said touch probes is affixed to a frame member of said apparatus to which said dispensing device is affixed; -

{b} (e) dispensing said polymer subunits to said discrete sites; - and

{e} (f) removing said substrate and/or said dispensing system from said relative dispensing position.

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27 (currently amended). A method according to Claim 26 wherein said first optical system for positioning said substrate mount comprises two or more image sensors and said substrate comprises a corresponding number of target images.

28 (currently amended). A method according to Claim 26 wherein said positioning of step (a) involves a calibration system, said first and second optical systems and said calibration system cooperating to position said substrate mount along said y-axis and said dispensing device along said x-axis.

29 (currently amended). A method according to Claim 28 wherein said calibration system comprises a locator device having a predetermined fixed target location and a camera acting in cooperation with said optical systems.

30 (currently amended). A method according to Claim 29 wherein adjustments are made to the orientation of said substrate along said x-axis y-axis as a result of input from said first optical system and wherein adjustments are made to the orientation of said dispensing device ~~and said substrate~~ mount along said y-axis x-axis as a results of input from said second optical system.

31 (previously presented). A method according to Claim 26 wherein said touch probes are aligned optically.

32 (original). A method according to Claim 26 wherein said biopolymers are polynucleotides or polypeptides.

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33 (original). A method according to Claim 32 further comprising exposing the array to a sample and reading the array.

34 (original). A method comprising forwarding data representing a result obtained from a reading of an array exposed according to the method of Claim 33.

35 (original). A method comprising transmitting to a remote location data representing a result of an interrogation obtained by reading of an array exposed according to the method of Claim 33.

36 (original). A method comprising receiving data representing a result of an interrogation obtained by reading of an array exposed according to the method of Claim 33.

Claims 37-47 (canceled).

48 (previously presented). An apparatus according to claim 2 wherein one of said touch probes is an upwardly pointing probe and the other of said touch probes is a downwardly pointing probe.

49 (previously presented). A method according to claim 26 wherein one of said touch probes is an upwardly pointing probe and the other of said touch probes is a downwardly pointing probe.